

# **Operating and Service Manual**

**Agilent 8490D/G, 8491A/B, 8493A/B/C  
Coaxial Fixed Attenuators**

**Agilent 11581A, 11582A, 11583C  
Attenuator Sets**



**Agilent Technologies**

**Manufacturing Part Number: 08491-90077**

**Printed in Malaysia**

**Print Date: January 2006**

**Supersedes: December 2001**

© Copyright Agilent Technologies, Inc 1994, 1999, 2001, 2006

---

## Notices

© Agilent Technologies, Inc. 2006

No part of this manual may be reproduced in any form or by any means (including electronic storage and retrieval or translation into a foreign language) without prior agreement and written consent from Agilent Technologies, Inc. as governed by United States and international copyright laws.

### Manual Part Number

08491-90077

### Edition

Fourth edition, January 2006

Printed in Malaysia

Agilent Technologies, Inc.  
Phase 3 Bayan Lepas Free Industrial Zone  
Bayan Lepas, Penang 11900 Malaysia

### Certification

Agilent Technologies certifies that this product met its published specifications at the time of shipment from the factory. Agilent Technologies further certifies that its calibration measurements are traceable to the United States National Institute of Standards and Technology (NIST, formerly NBS), to the extent allowed by the Institute's calibration facility, and to the calibration facilities of the other International Standards Organization members.

### Warranty

The material contained in this document is provided "as is," and is subject to being changed, without notice, in future editions. Further, to the maximum extent permitted by applicable law, Agilent disclaims all warranties, either express or implied, with regard to this manual and any information contained herein, including but not limited to the implied warranties of merchantability and fitness for a particular purpose. Agilent shall not be liable for errors or for incidental or consequential damages in connection with the furnishing, use, or performance of

this document or of any information contained herein. Should Agilent and the user have a separate written agreement with warranty terms covering the material in this document that conflict with these terms, the warranty terms in the separate agreement shall control.

**Limitation of Warranty** The foregoing warranty shall not apply to defects resulting from the improper or inadequate maintenance by the Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

NO OTHER WARRANTY IS EXPRESSED OR IMPLIED. AGILENT SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OR MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

**Exclusive Remedies** THE REMEDIES PROVIDED HEREIN ARE THE BUYER'S SOLE AND EXCLUSIVE REMEDIES. AGILENT SHALL NOT BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER BASED ON CONTRACT, TORT, OR ANY OTHER LEGAL THEORY.

### Technology Licenses

The hardware and/or software described in this document are furnished under a license and may be used or copied only in accordance with the terms of such license.

### Restricted Rights Legend

If software is for use in the performance of a U.S. Government prime contract or subcontract, Software is delivered and licensed as "Commercial computer software" as defined in DFAR 252.227-7014 (June 1995), or as a "commercial item" as defined in FAR 2.101(a) or as "Restricted computer software" as defined in FAR 52.227-19 (June 1987) or any equivalent agency regulation or contract clause. Use, duplication or disclosure of Software is subject to Agilent

Technologies' standard commercial license terms, and non-DOD Departments and Agencies of the U.S. Government will receive no greater than Restricted Rights as defined in FAR 52.227-19(c)(1-2) (June 1987). U.S. Government users will receive no greater than Limited Rights as defined in FAR 52.227-14 (June 1987) or DFAR 252.227-7015 (b)(2) (November 1995), as applicable in any technical data.

## Safety Notices

---

### CAUTION

A **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

---

### WARNING

A **WARNING** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a **WARNING** notice until the indicated conditions are fully understood and met.

---

## WEEE Compliance



This product complies with the WEEE Directive (2002/96/EC) marking requirements. The affixed label indicates that you must not discard this electrical/electronic product in domestic household waste.

Product Category: With reference to the equipment types in the WEEE Directive Annex I, this product is classed as a "Monitoring and Control Instrumentation" product.

Do not dispose in domestic household waste.

To return unwanted products, contact your local Agilent office, or see [www.agilent.com](http://www.agilent.com) for more information.

---

## Printing Copies of Documentation from the Web

To print copies of documentation from the Web, download the PDF file from the Agilent web site:

- Go to <http://www.agilent.com>.
- Enter the document's part number (located on the title page) in the Quick Search box.
- Click GO.
- Click on the hyperlink for the document.
- Click the printer icon located in the tool bar.

## Contacting Agilent (Americas, Asia Pacific & Japan)

### Contacting Agilent (Americas, Asia Pacific & Japan)

<b>Online assistance:</b> <a href="http://www.agilent.com/find/assist">www.agilent.com/find/assist</a>			
Americas			
Brazil (tel) (+55) 11 3351 7012 (fax) (+55) 11 3351 7024	Canada (tel) +1 877 894 4414 (alt) +1 303 662 3369 (fax) +1 800 746 4866	Mexico (tel) 1 800 254 2440 (fax) 1 800 254 4222	United States (tel) 800 829 4444 (alt) (+1) 303 662 3998 (fax) 800 829 4433
Asia Pacific and Japan			
Australia (tel) 1 800 802 540 (fax) 1 800 681 776 (fax) 1 800 225 539	China (tel) 800 810 0508 (fax) 800 810 0507	Hong Kong (tel) 800 933 229 (fax) 800 900 701	India (tel) 1600 112 626 (fax) 1600 113 040
Japan (Bench) (tel) 0120 421 345 (alt) (+81) 426 56 7832 (fax) 0120 01 2144	Japan (On-Site) (tel) 0120 421 345 (alt) (+81) 426 56 7832 (fax) 0120 012 114	Singapore (tel) 1 800 275 0880 (fax) (+65) 6755 1214	South Korea (tel) 080 778 0011 (fax) 080 778 0013
Taiwan (tel) 0800 047 669 (fax) 0800 047 667 (fax) 886 3492 0779	Thailand (tel) 1 800 2758 5822 (fax) 1 800 656 336	Malaysia (tel) 1800 880 399 (fax) 1800 801 054	
(tel) = primary telephone number; (alt) = alternate telephone number; (fax) = FAX number; * = in country number 5/6/05			

## Contacting Agilent (Europe)

<b>Online assistance:</b> <a href="http://www.agilent.com/find/assist">www.agilent.com/find/assist</a>			
Europe			
Austria (tel) 0820 87 44 11* (fax) 0820 87 44 22	Belgium (tel) (+32) (0)2 404 9340 (fax) (+32) (0)2 404 9395	Denmark (tel) (+45) 7013 1515 (fax) (+45) 7013 1555	Finland (tel) (+358) 10 855 2100 (fax) (+358) (0) 10 855 2923
France (tel) 0825 010 700* (fax) 0825 010 701*	Germany (tel) 01805 24 6333* (fax) 01805 24 6336*	Ireland (tel) (+353) (0)1 890 924 204 (fax) (+353) (0)1 890 924 024	Israel (tel) (+972) 3 9288 504 (alt) (+972) 3 9288 544 (fax) (+972) 3 9288 520
Italy (tel) (+39) (0)2 9260 8484 (fax) (+39) (0)2 9544 1175	Luxemburg (tel) (+32) (0)2 404 9340 (fax) (+32) (0)2 404 9395	Netherlands (tel) (+31) (0)20 547 2111 (fax) (+31) (0)20 547 2190	Russia (tel) (+7) 095 797 3963 (alt) (+7) 095 797 3900 (fax) (+7) 095 797 3902
Spain (tel) (+34) 91 631 3300 (fax) (+34) 91 631 3301	Sweden (tel) 0200 88 22 55* (alt) (+46) (0)8 5064 8686 (fax) 020 120 2266*	Switzerland (French) (tel) 0800 80 5353 opt. 2* (fax) (+41) (0)22 567 5313	Switzerland (German) (tel) 0800 80 5353 opt. 1* (fax) (+41) (0)1 272 7373
Switzerland (Italian) (tel) 0800 80 5353 opt. 3* (fax) (+41) (0)22 567 5314	United Kingdom (tel) (+44) (0)7004 666666 (fax) (+44) (0)7004 444555		
(tel) = primary telephone number; (alt) = alternate telephone number; (fax) = FAX number; * = in country number 5/6/05			

## Contacting Agilent (Europe)

---

## Contents

Notices .....	ii
WEEE Compliance .....	iii
Printing Copies of Documentation from the Web .....	iii
Contacting Agilent (Americas, Asia Pacific & Japan).....	iv
Contacting Agilent (Europe) .....	v
General Information .....	1
Attenuator Overview .....	1
Features .....	2
Optional Calibration Data .....	2
Attenuator Sets .....	2
Specifications .....	3
Environmental Specifications .....	9
Installation .....	10
Initial Inspection .....	10
Operating Instruction .....	12
Operator's Check.....	12
Using Oscillator and SWR Meter .....	12
Using Network Analyzer.....	14
Making Connections .....	15
Performance Tests .....	19
Service Instructions .....	19
Repair .....	19
Maintenance .....	19
Replacement Parts .....	20

## Contents



## General Information

### Attenuator Overview

The 8490D/G, 8491A/B, and 8493A/B/C are small, light-weight, low-power, 50-ohm coaxial fixed attenuators.

The attenuators cover broad frequency ranges and choice of connector types. Each model comes with options to accommodate various attenuation values as shown in [Table 1](#).

**Table 1** *List of Coaxial Fixed Attenuators*

Model	Options	Frequency Range	Connector Type
8490D	003, 006, 010, 020, 030, 040	dc to 50 GHz	2.4 mm (m), (f)
8490G	003, 006, 010, 020, 030, 040	dc to 67 GHz	1.85mm (m), (f)
8491A	003, 006, 010, 020, 030, 040, 050, 060	dc to 12.4 GHz	Type N (m), (f)
8491B	003, 006, 010, 020, 030, 040, 050, 060	dc to 18 GHz	Type N (m), (f)
8493A	003, 006, 010, 020, 030	dc to 12.4 GHz	SMA 3 mm (m), (f)
8493B	003, 006, 010, 020, 030	dc to 18 GHz	SMA 3 mm (m), (f)
8493C	003, 006, 010, 020, 030, 040	dc to 26.5 GHz	3.5 mm (m), (f)

The option number indicates the attenuation value. For example, option 003 indicates 3 dB attenuation, option 010 indicates 10 dB attenuation and so on.

## General Information

### Features

- Ruggedness, reliability, and small size make these attenuators useful both on the bench and in systems applications.
- Accuracy and low SWRs make the attenuators well suited for extending the range of sensitive power meters for higher power measurements and applications such as calibration standards and RF substitution measurements.
- Each attenuator is tested with a vector network analyzer for attenuation, and a plot of actual attenuation values is printed on the label attached to the body of the attenuator (except for the 8490D/G and 8493C).

### Optional Calibration Data

Option UK6 calibration data, which is generated by a network analyzer, provides a tabulated list of attenuations and reflection coefficients in which the number of frequency points provided depends on the model number and frequency range. Option UK6 calibration data is available when attenuators are first purchased and recalibrations are available through Agilent Technologies Service Centers.

### Attenuator Sets

The 11581A, 11582A, and 11583C are boxed sets of four coaxial fixed attenuators of 3, 6, 10, and 20 dB as shown in [Table 2](#).

Each attenuator set comes with a printed calibration report that gives the actual attenuation and reflection coefficient of each port at frequencies from 100 MHz to 12.4 GHz for 11581A, 100 MHz to 18 GHz for 11582A and 100 MHz to 26.5 GHz for 11583C, at increments from 100 to 500 MHz.

**Table 2** *List of Attenuator Boxed Sets*

Model	Contents	Frequency Range
11581A	8491A (3, 6, 10, and 20 dB)	dc to 12.4 GHz
11582A	8491B (3, 6, 10, and 20 dB)	dc to 18 GHz
11583C	8493C (3, 6, 10, and 20 dB)	dc to 26.5 GHz

## Specifications

The specifications refer to the performance standards or limits against which the coaxial fixed attenuators are tested.

**Table 3** *Specifications for 8490D Coaxial Fixed Attenuator*

Option <sup>1</sup>	Minimum Attenuation in dB		Maximum Attenuation in dB	
	dc to 50 GHz	dc to 26.5 GHz	26.5 to 50 GHz	26.5 to 50 GHz
003	2.5	3.9	4.8	
006	5.4	6.9	7.8	
010	9.4	10.9	11.3	
020	19.2	21.3	21.7	
030	29.2	31.3	31.7	
040	38.2	42.5	42.5	
		Maximum SWR		
Option <sup>1</sup>	dc to 26.5 GHz	26.5 to 40 GHz	40 to 50 GHz	
003	1.15	1.25	1.45	
060	1.15	1.25	1.45	
010	1.15	1.25	1.45	
020	1.15	1.25	1.45	
030	1.15	1.25	1.45	
040	1.08	1.15	1.25	
Maximum Input Power	1 W avg, 100 W pk			
Connectors (50 Ω)	2.4 mm			
Dimension (Length)	1.06 in. (27 mm) for options 003, 006, 010, 020 1.14 in. (29 mm) for options 030, 040			
Diameter	0.312 in. (8 mm)			

1. Option numbers indicate the attenuation values. For example, option 003 indicates 3 dB attenuation, option 010 indicates 10 dB attenuation and so on.

## Specifications

**Table 4** Specifications for 8490G Coaxial Fixed Attenuator

Option <sup>1</sup>	Maximum Attenuation in dB			
	dc to 67 GHz	dc to 26.5 GHz	26.5 to 50 GHz	50 to 67 GHz
003	2.5	3.9	4.4	4.8
006	5.4	6.9	7.4	7.8
010	9.4	10.9	11.1	11.3
020	19.2	21.3	21.5	21.7
030	29.2	31.3	31.5	31.7
040	38.0	42.5	42.5	42.5

Option <sup>1</sup>	Maximum SWR		
	dc to 26.5 GHz	26.5 to 50 GHz	50 to 67 GHz
003	1.15	1.25	1.45
060	1.15	1.25	1.45
010	1.15	1.25	1.45
020	1.15	1.25	1.45
030	1.15	1.25	1.45
040	1.10	1.15	1.25

Maximum Input Power	1 W avg, 100 W pk
Connectors (50 Ω)	1.85 mm
Dimension (Length)	1.06 in. (27 mm) for options 003, 006, 010, 020 1.10 in. (28 mm) for options 030, 040
Diameter	0.312 in. (8 mm)

1. Option numbers indicate the attenuation values. For example, option 003 indicates 3 dB attenuation, option 010 indicates 10 dB attenuation and so on.

**Table 5** Specifications for 8491A and 8493A Coaxial Fixed Attenuators

Attenuation Accuracy in dB		
Option <sup>1</sup>	dc to 12.4 GHz	
003	± 0.3	
006	± 0.3	
010	± 0.5	
020	± 0.5	
030	± 1.0	
040 <sup>2</sup>	± 1.5	
050 <sup>2</sup>	± 1.5	
060 <sup>2</sup>	± 2.0	
SWR		
Option <sup>1</sup>	dc to 8 GHz	8 to 12.4 GHz
003	1.25	1.35
006	1.2	1.3
010	1.2	1.3
020	1.2	1.3
030	1.2	1.3
040 <sup>2</sup>	1.2	1.3
050 <sup>2</sup>	1.2	1.3
060 <sup>2</sup>	1.2	1.3
Maximum Input Power	2 W avg, 100 W pk	
Connectors (50 Ω)	8491A: Type N <sup>3</sup>	8493A: SMA <sup>4</sup>
Dimension (Length)	8491A: 2-7/16 in. (67 mm)	8493A: 1-9/16 in. (40 mm)
Diameter	8491A: 13/16 in. (21 mm)	8493A: 1/2 in. (13 mm)

- Option numbers indicate the attenuation values. For example, option 003 indicates 3 dB attenuation, option 010 indicates 10 dB attenuation and so on.
- Options 040, 050, and 060 are not available for 8493A.
- Mate with MIL-C-71 and MIL-C-39012 connectors.
- Miniature SMA type.

## Specifications

**Table 6** Specifications for 8491B and 8493B Coaxial Fixed Attenuators

Option <sup>1</sup>	Attenuation Accuracy in dB		
	dc to 12.4 GHz	12.4 to 18 GHz	
003	± 0.3	± 0.3	
006	± 0.3	± 0.4	
010	± 0.6	± 0.6	
020	± 0.6	± 1.0	
030	± 1.0	± 1.0	
040 <sup>2</sup>	± 1.5	± 1.5	
050 <sup>2</sup>	± 1.5	± 1.5	
060 <sup>2</sup>	± 2.0	± 2.0	

Option <sup>1</sup>	SWR		
	dc to 8 GHz	8 to 12.4 GHz	12.4 to 18 GHz
003	1.25	1.35	1.5
006	1.2	1.3	1.5
010	1.2	1.3	1.5
020	1.2	1.3	1.5
030	1.2	1.3	1.5
040 <sup>2</sup>	1.2	1.3	1.5
050 <sup>2</sup>	1.2	1.3	1.5
060 <sup>2</sup>	1.2	1.3	1.5

Maximum Input Power	2 W avg, 100 W pk	
Connectors (50 Ω)	8491B: Type N <sup>3</sup>	8493B: SMA <sup>4</sup>
Dimension (Length)	8491B: 2-7/16 in. (67 mm)	8493B: 1-9/16 in. (40 mm)
Diameter	8491B: 13/16 in. (21 mm)	8493B: 1/2 in. (13 mm)

- Option numbers indicate the attenuation values. For example, option 003 indicates 3 dB attenuation, option 010 indicates 10 dB attenuation and so on.
- Options 040, 050, and 060 are not available for 8493B.
- Mate with MIL-C-71 and MIL-C-39012 connectors.
- Miniature SMA type.

**Table 7** Specifications for 8493C Coaxial Fixed Attenuator

Option <sup>1</sup>	Attenuation Accuracy in dB		
	dc to 18 GHz	18 to 26.5 GHz	
003	± 0.5	± 1.0	
006	± 0.6	± 0.6	
010	± 0.3	± 0.5	
020	± 0.5	± 0.6	
030	± 0.7	± 1.0	
040	± 1.0	± 1.3	

Option <sup>1</sup>	SWR		
	dc to 8 GHz	8 to 12.4 GHz	12.4 to 26.5 GHz
003	1.10	1.15	1.25
006	1.10	1.15	1.27
010	1.10	1.15	1.25
020	1.10	1.15	1.25
030	1.10	1.15	1.25
040	1.10	1.15	1.25

Maximum Input Power	2 W avg, 100 W pk
Connectors (50 Ω)	3.5 mm
Dimension (Length)	1-15/16 in. (33.8 mm) for options 003, 006, 010, 020 1-7/16 in. (36.8 mm) for options 030, 040
Diameter	5/16 in. (8 mm)

1. Option numbers indicate the attenuation values. For example, option 003 indicates 3 dB attenuation, option 010 indicates 10 dB attenuation and so on.

## Specifications

Table 8 and Table 9 apply to the following boxed sets of four attenuators.

- The 11581A attenuator set contains a 3, 6, 10, and 20 dB 8491A.
- The 11582A attenuator set contains a 3, 6, 10, and 20 dB 8491B.
- The 11583C attenuator set contains a 3, 6, 10, and 20 dB 8493C.

**Table 8 Accuracy of Insertion Loss Measurements ( $S_{21}$ ,  $S_{12}$ )**

Attenuation	<i>dc to 4 GHz</i>	<i>4 to 12 GHz</i>	<i>12 to 18 GHz</i>
3 dB	$\pm 0.01$ dB	$\pm 0.06$ dB	$\pm 0.11$ dB
6 dB	$\pm 0.01$ dB	$\pm 0.07$ dB	$\pm 0.11$ dB
10 dB	$\pm 0.01$ dB	$\pm 0.07$ dB	$\pm 0.12$ dB
20 dB	$\pm 0.01$ dB	$\pm 0.08$ dB	$\pm 0.13$ dB

**Table 9 Accuracy of Reflection Coefficient Measurements ( $S_{11}$ ,  $S_{22}$ )**

Model	Female		Male	
	<i>4 to 12 GHz</i>	<i>12 to 18 GHz</i>	<i>4 to 12 GHz</i>	<i>12 to 18 GHz</i>
11581A	$\pm 0.006$ dB	-	$\pm 0.006$ dB	-
11582A	$\pm 0.006$ dB	$\pm 0.010$ dB	$\pm 0.006$ dB	$\pm 0.006$ dB
11583C	$\pm 0.007$ dB	$\pm 0.007$ dB	$\pm 0.007$ dB	$\pm 0.007$ dB



---

## Environmental Specifications

The 849x coaxial fixed attenuators and 1158x attenuator sets are designed to fully comply with Agilent Technologies' product operating environmental specifications as shown [Table 10](#).

**Table 10** *849x Coaxial Fixed Attenuator and 1158x Attenuator Sets Environmental Specifications*

<b>Temperature:</b>	
Operating	0°C to +55°C
Storage	-55°C to +85°C
<b>Humidity:</b>	
Operating	<95% relative at 40°C
Storage	<95% relative at 40°C
<b>Altitude:</b>	
Operating	<4,600 meters (15,000 feet)
Storage	<15,300 meters (50,000 feet)

## Installation

- Initial Inspection**
1. Inspect the shipping container for damage. If the shipping container or cushioning material is damaged, it should be kept until the contents of the shipment have been checked for completeness and the instrument has been checked both mechanically and electrically.
    - Check for mechanical damage such as scratches or dents.
    - Procedures for checking electrical performance are given under “Operator’s Check” or “Performance Tests”.
  2. If the contents are incomplete, if there is mechanical damage or defect, or if the instrument does not pass the electrical performance test, contact the nearest Agilent Technologies Sales and Service office. Refer to the Service and Support information in the front matter of this manual. Agilent Technologies will arrange for repair or replacement of the damaged or defective equipment. Keep the shipping materials for the carrier’s inspection.
  3. If you are returning the instrument under warranty or for service, repackaging the instrument requires original shipping containers and materials or their equivalents. Agilent Technologies can provide packaging materials identical to the original materials. Refer to Service and Support information in the front matter of this manual for the Agilent Technologies nearest you. Attach a tag indicating the type of service required, return address, model number, and serial number. Mark the container **FRAGILE** to insure careful handling. In any correspondence, refer to the instrument by model number and serial number.

**Returning  
Attenuators  
Under Warranty**

“Bad contacts” attenuators are returnable under warranty while “burned out” attenuators are not. These terms are defined as follows:

- “Bad Contacts”: Attenuation is within specifications at 8 GHz or higher; attenuation is at least 3 to 5 dB higher than specification at dc and 1 kHz.
- “Burned Out”: Attenuation is at least 3 to 5 dB higher than specification at dc and entire rated frequency range.

---

## Operating Instruction

### Operator's Check

The operator's check is supplied to allow the operator to make a quick check of the attenuators prior to use or if a failure is suspected.

### Using Oscillator and SWR Meter

#### Description

The attenuator is driven from a 50-ohm signal source at 1 kHz. The output level from the attenuator is detected by a narrow-bandwidth voltmeter (that is, the SWR meter). A reference level is set up on the detector using a through connection in place of the attenuator. The attenuator is then inserted and the change in the detector level is noted. This checks the low frequency accuracy of the attenuator.

---

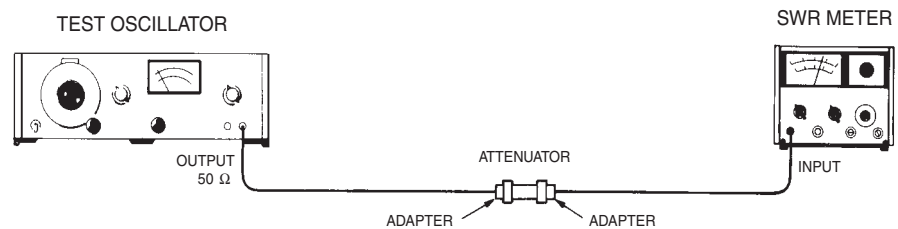
#### NOTE

The SWR meter used in this check is calibrated for a square-law detector and therefore the range changes and errors (read in dB) are twice that indicated by the meter.

---

#### Quick-Check Procedure

1. Connect the equipment as shown in the [Figure 1](#) except remove the attenuator and connect the adapters directly together.



*Figure 1 Equipment Setup Using Oscillator and SWR Meter*

2. Set the test oscillator to 0.3 Vrms at 1 kHz.
3. Set the SWR meter range to 2 dB (expanded) or for the 3 dB, 6 dB, and 10 dB (expanded) as appropriate and adjust its bandwidth to the center of the adjustment range. Fine tune the oscillator frequency to obtain maximum meter indication. Adjust the oscillator output to obtain the SWR meter reading in the table below.
4. Connect the attenuator into the system, adjust the SWR meter range switch as listed in [Table 11](#), and verify that the SWR meter indicates within the limits as shown [Table 11](#).

**Table 11 SWR Verification**

Attenuation (dB)	SWR Meter Range (dB)	Meter Indication (dB)		
		Minimum	Actual	Maximum
0 (System Cal)	2 (or 10) <sup>1</sup>	Set to 0.5 (or 0.0) <sup>1</sup>		
3	10	1.35		1.65
6	12	0.85		1.15
10	14	0.75		1.25
20	12	0.25		0.75
30	16	1.00		2.00
40	22	-0.25		1.25
50	26	0.75		2.25
60	32	-0.50		1.50

1. Set SWR meter range to 10 dB and power level to 0.0 dB for 3 dB, 6 dB, and 10 dB attenuators only.

## Operating Instruction

### Using Network Analyzer

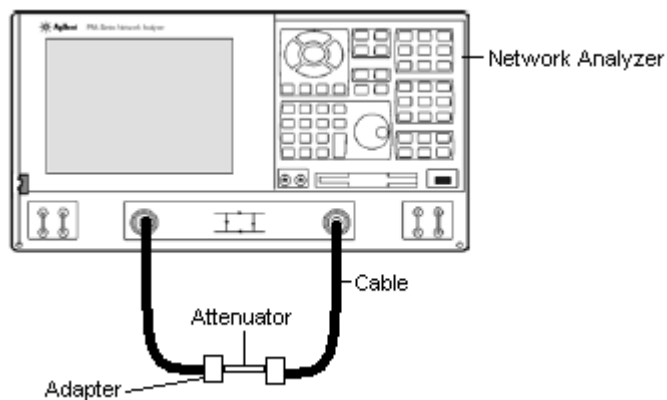
#### Description

All four s-parameters of the attenuator are measured using a network analyzer that is already calibrated with the necessary settings.

#### Quick-Check Procedure

Use correct cables and adapters on the test ports of the network analyzer. This depends on the type of the attenuator being checked. The equipment setup is as illustrated in [Figure 2](#).

1. Calibrate the network analyzer with appropriate settings and setup necessary.
2. Measure the  $S_{21}$  or/and  $S_{12}$  of the attenuator. Compare with the specification to verify its electrical performance.
3. Measure the  $S_{11}$  and  $S_{22}$  of the attenuator. Compare with the specification to verify its electrical performance.



*Figure 2 Equipment Setup Using Network Analyzer*

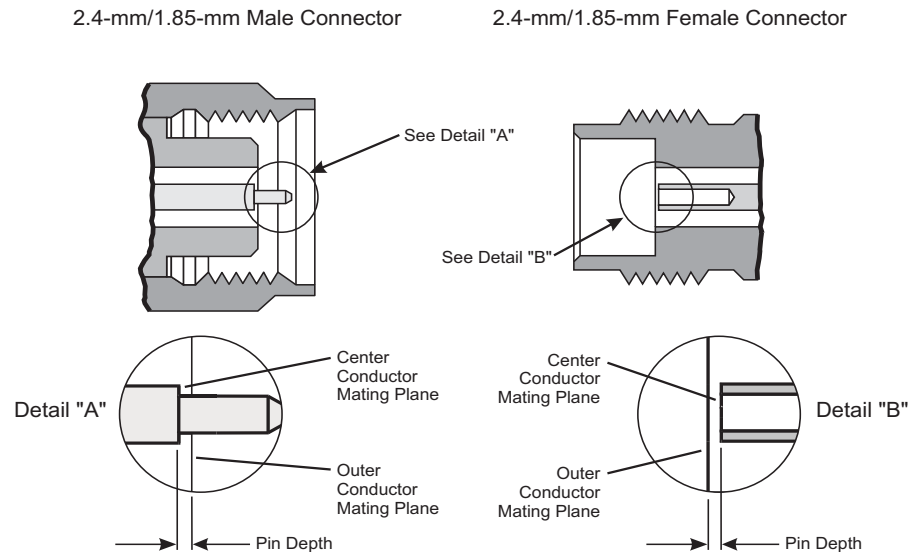
## Making Connections

The attenuators should not bear any force or weight contributed by other devices connected to them. The attenuators are bidirectional, that is, the signal may be inserted from either end.

### 8490D/G

The 8490D 2.4-mm connectors mate with other 2.4-mm connectors of the opposite sex.

The 8490G 1.85-mm connectors mate with other 1.85-mm connectors of the opposite sex.



**Figure 3**      **2.4-mm/1.85mm Connector Diagram**

## Making Connections

### 8491A/B

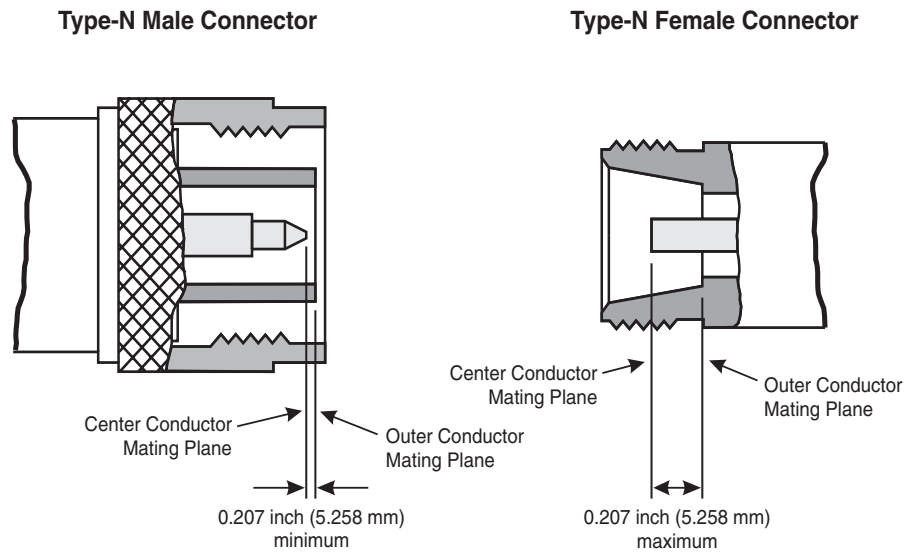
The 8491A/B type-N connectors mate with all type-N connectors whose dimensions conform to IEE STD 287.

---

#### NOTE

*Do not* mate with 0.071 inch diameter pin *male* connector. Damage will result.

---



**Figure 4** Type-N Connector Diagram



8493A/B

The 8493A/B has a male SMA jack on one end and a female SMA on the other. These connectors mate with the opposite sex SMA connectors

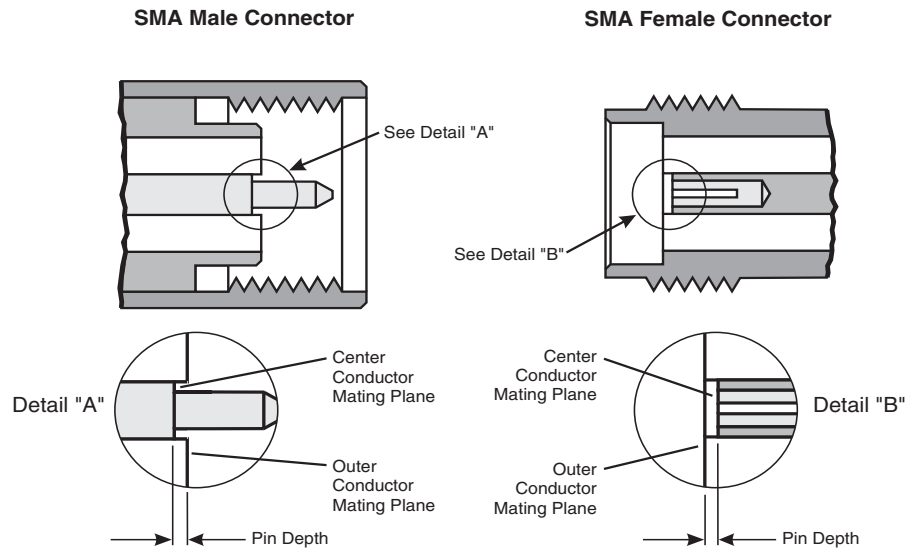


Figure 5 SMA Connector Diagram

## Making Connections

### 8493C

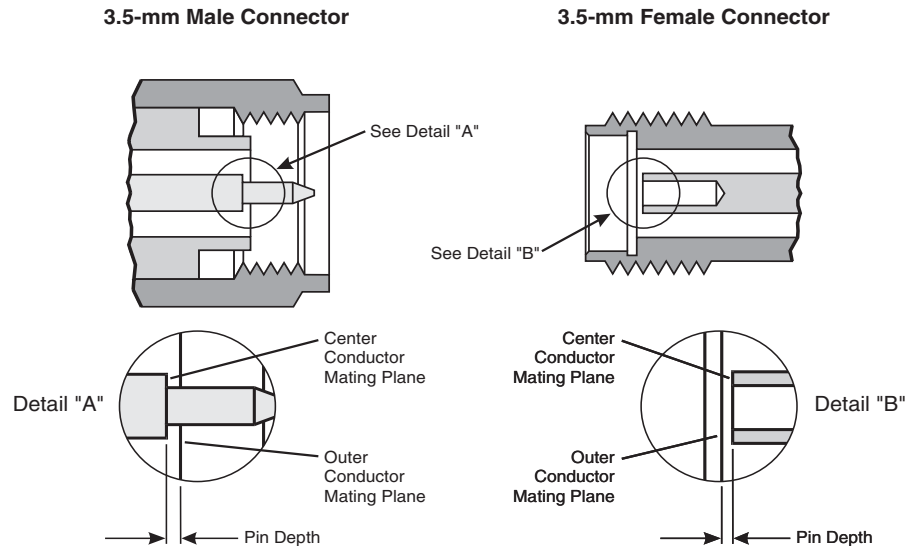
The 8493C has a male 3.5-mm connector on one end and a female 3.5-mm connector on the other side. These connectors mate with the opposite sex 3.5-mm or SMA connectors.

---

### NOTE

Continued mating with SMA connectors could degrade the 3.5-mm connector.

---



**Figure 6** 3.5-mm Connector Diagram

---

## Performance Tests

The attenuators can be tested to the accuracy of the specifications with a network analyzer or equivalent equipment of suitable accuracy. If a network analyzer is available, test the instrument using the procedure in the analyzer's operating manual.

---

## Service Instructions

### **Repair**

The 8490D/G, 8491A/B the 8493A/B/C attenuators are not recommended for repair since the cards must be mounted in cartridges to test and testing costs more than a replacement attenuator.

### **Maintenance**

The connectors, particularly the connector faces, must be kept clean. This is especially true of the 8493A/B/C.

For instruction on connecting and care of your connectors, refer to the Microwave Connector Care Quick Reference Card (08510-90360).

## Replacement Parts

---

## Replacement Parts

Table 12 lists the generic replacement parts for 11581A, 11582A and 11583C, which are the only parts that can be replaced without access to the interior of the attenuator.

**Table 12** *Generic Replacement Parts for Attenuator Sets*

Description	Part Number
Foam Pad (top, all sets)	9220-1291
Foam Pad (bottom, all sets)	9220-3697
Box, Walnut (all sets)	9211-1009

Table 13 lists the replacement parts for Agilent 8490G coaxial fixed attenuators only.

**Table 13** *Replacement Parts for 8490G*

Description	Agilent Part Number	Qty
Replacement item for 8490G-003	08490-60021	1
Replacement item for 8490G-006	08490-60022	1
Replacement item for 8490G-010	08490-60023	1
Replacement item for 8490G-020	04890-60024	1
Replacement item for 8490G-030	08490-60025	1
Replacement item for 8490G-040	08490-60026	1